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THE NEED OF RURAL ENGINEERS

By W. H. Beal,

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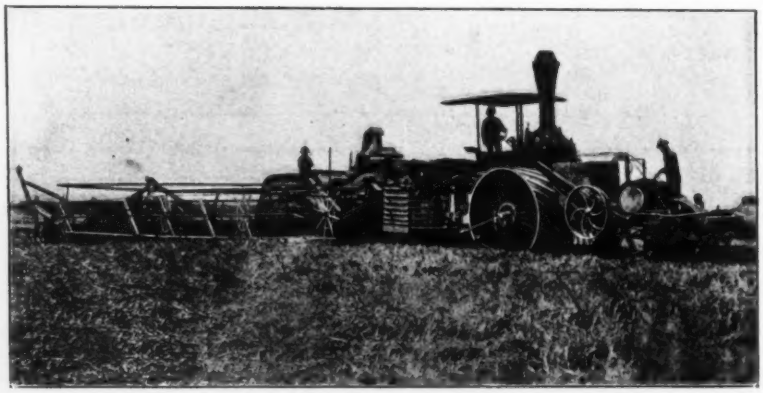
RURAL engineering has been defined by the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations as "the science and art of laying out farms, designing and constructing farm buildings and works, and making and using farm implements and machinery." It therefore constitutes a very important subdivision of the great subjects of agriculture, for it will be admitted without question that successful farming under an advanced system of agriculture is nowhere possible without properly laid out farms, good roads, thorough drainage, suitable and properly constructed farm houses and outbuildings, and efficient farm implements and machinery, while, as is well known, irrigation is indispensable to any sort of farming in the large area of our territory where rainfall is deficient and has been proven profitable as an insurance against drought in regions where the rainfall is usually sufficient for successful agriculture. Yet it is safe to assert that with the exception of irrigation and road making probably no feature of American agriculture has received less attention in their broader aspects from our organized agencies for agricultural education and research than the subjects classed above under the broad term of rural engineering.

The need and advantages of *good roads* from an agricultural standpoint and the vast opportunities for the exercise of engineering skill in their construction and maintenance are so well known that it is not necessary to dwell on the subject here. That public sentiment is being aroused to some purpose on this subject is shown by the work of the highway commissions of Massachusetts, New Jersey, and other States under State and County aid, and by the fact that the recent legislature of the State of New York appropriated some $50,000,000 for the improvement of the highways of that State.

Public interest in the reclamation of land for agricultural purposes by *irrigation* has also been quite generally aroused, and the area of agricultural production has already been greatly extended and is being rapidly enlarged by this means under the influence of federal and private enterprise.

The need and practicability of reclamation of land by *drainage* has been largely lost sight of in the rush for new lands. Such reclamation is bound to grow in importance as the public mind becomes aroused to its possibilities. It is estimated there are at least 100,000,000 acres of unproductive marsh and swamp lands which can be brought under cultivation and made highly productive by drainage, and this is probably as much as will ever be reclaimed by irrigation. Furthermore, the benefits of systematic drainage will be more generally diffused than those of irrigation, for they apply to the vast tide marshes of our coasts, inland swamps, low lying lands of our prairies, and the seeped lands of the irrigated region; while there is hardly a cultivated farm in the United States which would not be benefited to some extent by im-



THE COMBINED HARVESTER AND THRESHER
One of the highest achievements of American mechanical skill in the service of agriculture
BY COURTESY OF THE U. S. DEPT. OF AGR.

proved drainage. In many cases the lands capable of reclamation by drainage lie at the very gates of the larger markets and can be reclaimed at less cost than would be involved in bringing new land under irrigation.

Although farm drainage has long been practiced as one of the important aids to increased production, the drainage of large areas calls for expert advice in solving both the legal and engineering problems. It is now recognized that in many localities much drainage work has been poorly done, and that more scientific and thorough methods are required in draining land for the more intensive cultivation demanded on high-priced land.

In other words, in this as in other lines of agricultural development, systematic investigation and the services of experts are required to furnish a safe basis for large enterprises, and to work out the special problems presented by different sets of conditions. The field is one of immense possibilities, viewed either from the standpoint of reclamation or of the important agricultural problems presented.

The third grand division of rural engineering as outlined above, but one which has received but comparatively little systematic scientific study in the United States is *agricultural implements and machinery, or agricultural mechanics.*

It may be truly claimed that American inventive genius and mechanical skill have unaided surpassed the world in the construction of farm machinery, but in the organization of courses of instruction and in the training of expert specialists in this important field we have not kept pace with European leaders in agricultural education and investigation. This fact was very clearly brought out at the International Congress of Agricultural Mechanics held at Liege, Belgium, in August, 1905, which was attended by representatives of 20 countries, including several hundred men connected with institutions giving special attention to this subject, as well as manufacturers and users of farm implements and machines. In a paper which the writer of this article submitted to that congress he summed up his views as to the progress and purpose of education and research with reference to farm machinery in the United States as follows:

Improved agricultural implements and machinery have played a most important role in the agricultural development and general welfare of the United States. The general use of labor-saving machinery and the success of American inventors and man-

ufacturers in constantly improving and adding to such machinery have resulted in a steady decrease in the labor cost of agricultural production notwithstanding a simultaneous rise in wages. The growing scarcity of farm labor, however, is so enlarging the demand for labor-saving devices that the need of increased facilities for instruction and investigation with reference to improved methods of construction and use of such devices is beginning to be felt in the United States. The National Department of Agriculture and the State Agricultural Colleges and Experiment Stations are therefore undertaking investigations and planning courses of instruction which are intended, on the one hand, to promote more extended and efficient use of agricultural machinery, and on the other to assist manufacturers in the construction of implements and machines which will best meet the special needs of the farmers. In this respect they are following the example of several of the European institutions which have done most valuable work in the systematic study and improvement of farm machinery.

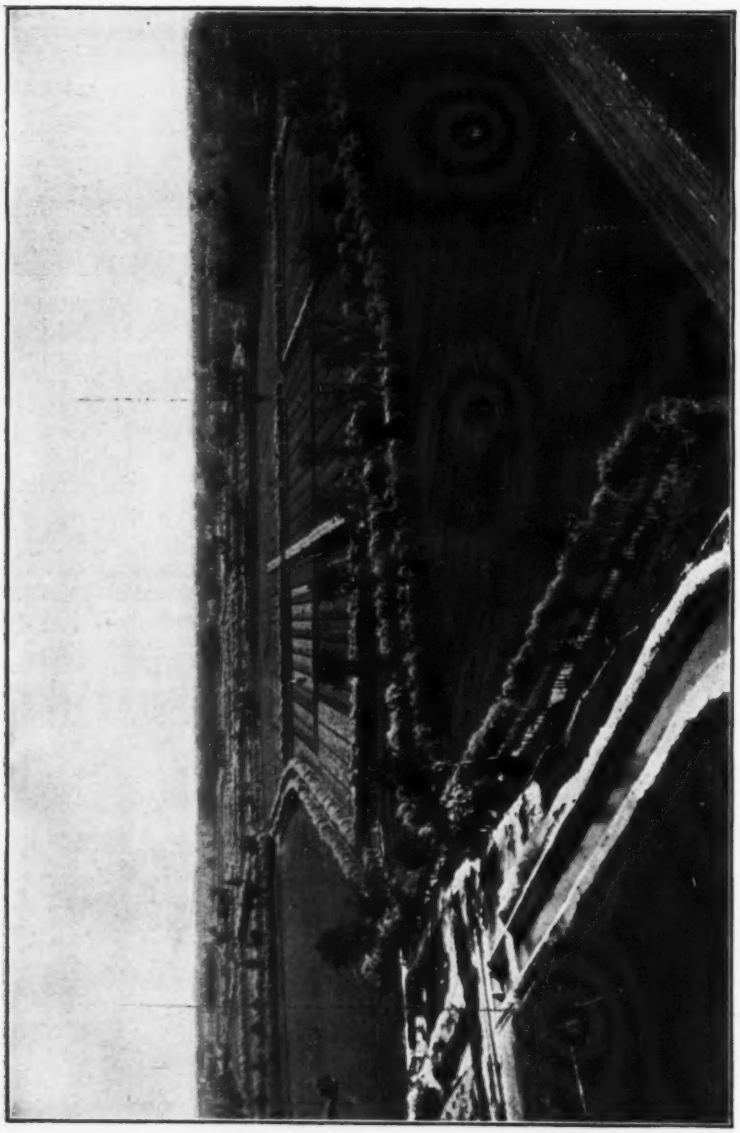
The courses of instruction and systematic investigation of the kind referred to are, however, still very limited in this country. Their further development would seem to be essential to the maintenance of our supremacy in this important field.

The location, designing, and construction of *farm buildings,* the selection of materials to be used in such structures, and the providing of suitable water supply and sewage disposal systems on the farm call for engineering and mechanical skill of a high order. Formerly farm buildings were mainly storage places for implements and products and shelter for stock. With the advance of agriculture farm buildings have become more complex in construction and use, and in many cases must be as carefully planned and constructed as factories. Not only is there a wide field for the exercise of skill in the improvement of their design to more perfectly meet the requirements of modern agriculture, but the question of materials used in their construction must receive increased attention. So long as

UNION OF AN IRRIGATION AND A DRAIN DITCH
a. Irrigation ditch; *b*, drain ditch Drainage is the twin sister of irrigation. Irrigated lands must also be drained

BY COURTESY OF THE U. S. DEPT. OF AGR.

lumber was abundant and cheap, wood was in most cases the most desirable material, but with the growing scarcity and increasing cost of lumber other materials must be tested with reference to their suitability to the purposes of construction. Moreover, under modern conditions of high-bred, high-priced stock the question of stable sanitation, heating, lighting, and ventilation has assumed an importance second only to that of house sanitation.



VIEW OF IRRIGATED LANDS UNDER VETTABBIA CANAL, ITALY
In one of the most scientifically irrigated regions in the world

BY COURTESY OF THE U. S. DEPT. OF AGR.

The question of the application of

different kinds of *power* to farm purposes (pumping, grinding, threshing, etc.) is rapidly assuming great importance, and the adaptation of different kinds of fuel, such as gasoline, crude petroleum, and denatured alcohol, to motors of different kinds is arousing a great deal of interest at the present time and will doubtless become a large factor in the development of our agriculture.

One of the greatest difficulties encountered in attempts to develop these various phases of rural engineering is *the lack of men of the special training* required. The supply of good engineers is abundant, but the number of men who are capable of looking at such engineering problems as we have been considering from agricultural standpoint and of seeing quickly and clearly their agricultural relationships and applications is comparatively small. The planning and inauguration of such work calls for some agricultural knowledge. The man with an agricultural outlook, who knows in a general way the methods and needs of different kinds of farming, has a distinct advantage over the man trained merely as an engineer; and, moreover, such a man can see the problems of a section, the possibility of remedying them, and the practicability of such an undertaking. What is needed, therefore, is a larger class of men who combine engineering training with a thorough knowledge of agricultural conditions and an understanding of the practical requirements of farm life. It would be well also for the expert in rural engineering to have definite training in the other branches of the science and art of agriculture, and for this purpose courses in our agricultural colleges should be open to him.

It is not surprising that the supply of rural engineers is small in the United States when we consider that until very recently there have been no systmatic courses of instruction for such engineers in this country. Several of our agricultural colleges, however, with the assistance of the National Department of Agriculture, are beginning to organize such courses and we may confidently look forward in the near future to a more abundant supply of well trained rural engineers. Young men entering our agricultural colleges and looking about for a promising line of study fitting them for a career in which the outlook for remunerative employment is exceptionally good might well give serious consideration to the subject of rural engineering. The present interest and activity in work of this sort, and the probabilities of development in the near future, make the outlook for such specialists very good.

FARM MACHINERY AND ITS RELATION TO AGRICULTURAL DEVELOPMENT

By J. B. Davidson,

Associate Professor of Agricultural Engineering, Iowa State College

ONE of the requirements for a steady, healthy growth of any people, or nation, is a bountiful supply of food. The earth can be made to produce in abundance only when the soil is tilled and plants suitable for food are cultivated. As long as the people of the earth roamed about obtaining their subsistance by hunting and fishing, conditions were not favorable for a rapid increase in population or an advance in civilization. Tribes of nations constantly encroached upon each other's rights and were continually at war. History shows that when any nation was isolated so as to be protected from the attacks of other nations and devoted itself to agricultural pursuits, its government at once became more stable and life and property more secure. Protected in this way, a great nation, shut off from the rest of the world by natural means, and located in a

fertile country, arose along the banks of the Nile long before any other nation reached prominence. The Gauls became mighty because they devoted themselves to agriculture and obtained in this way a more reliable supply of food. Pliny, the elder, in his writings, tells of the fields of Gaul and describes some of the tools used. It has been estimated that there never were more than 400,000 Indians in North America and they were often in want of food. Compare this number with the present population. The tribes that flourished and increased in numbers were those who had fields of grain and a definite source of food. England never became a great nation until she developed her commerce and brought food from other countries for her people.

When people began to turn their attention to farming they began to devise tools to aid them in their work. Various kinds of hoes, crude plows, sickles and scythes were invented but were practically all hand tools. Work with these was necessarily very laborious and slow. The hours of labor in consequence were very long and the social position of the tiller of the soil was low. He was in every sense of the term "the man with the hoe." He became prematurely old and bent, his lot was anything but enviable.

For more than three thousand years the farmers of Europe, and in this country until after the Revolutionary War, used the same crude tools and primitive methods as were employed by the Egyptians and Israelites. In fact, it has been, relatively speaking, only a few years since the change from hand to machine methods took place. In the Twelfth Census Report the following statement is made: "The year 1850 practically marks the close of the period in which the only farm implements and machinery other than the wagon, cart, and cotton gin, were those which, for want of a better designation, may be called implements of hand production."

McMaster in his History of the People of the United States, says: "The Massachusetts farmer who witnessed the Revolution plowed his land with the wooden bull plow, sowed his grain broadcast, and when it was ripe, cut it with a scythe and threshed it out on his barn floor with a flail." He writes further that the poor whites of Virginia in 1790 lived in log huts "with the chinks stuffed with clay; the walls had no plaster, the windows had no glass, the furniture was such as they themselves had made. Their grain was threshed by driving horses over it in the open field. When they ground it they used a rude pestle and mortar or placed it in a hollow of a stone and beat it with another."

At any rate a great change has taken place and all in little over a half century. This great change from the simplest of tools to the modern, almost perfect implements, has produced a marked effect upon the life of the farmer. He is no longer "the man with the hoe" but a man well trained intellectually.

One of the marked effects of the change to modern machinery methods, has been a shortening of the length of the working day. When the work was done by hand methods the day during the busy season was from early morn till late at night. Often as much as sixteen hours per day were spent in the fields. Now field work seldom exceeds ten hours.

According to McMaster, in 1794 "in the states north of Pennsylvania the wages of the common laborer was not to exceed $3 per month and in Vermont good men were employed for 18 pounds per year." Even as late as in 1849 the wages, according to several authorities, did not exceed $120 per year. Under present conditions the farm laborer is able to demand two, three and even five times as much. In countries where hand methods are still practiced wages are very low. Men are required to work all day from early morning till late at night for a few cents. In some of the Asiatic countries it is said that men work from four in the morning until nine at night for 14 cents.

It is not difficult to realize that a great change for the better had taken place in the physical and mental nature of the farmer. It is infinitely easier for a man to sit on a modern harvester, watch the machine and drive the team, than it is to work all day with bended back, scuffling along, running a cradle. How much easier it is to handle the modern crop, tho much larger, with the modern threshing machine where the bundles are simply thrown into the feeder than to spend the entire winter season beating the grain out with a flail. The farmer can now do his work and still have time to plan his business and to think of improvements.

During the change from hand to machine methods, there was a great decrease in the per cent of the people of the United States living upon the farms. It has been estimated that in 1800, 97% of the people were to be found upon the farms. By 1849 this proportion had decreased to 90% and according to the Twelfth Census Report, it was only 35.7%. Notwithstanding this decrease in the per cent of the people upon the farms there has been, since the introduction of machinery, a great increase in production per capita. In 1800 it is estimated that 5.50 bushels of wheat were produced per capita; in 1850, according to the Division of Statistics, Department of Agriculture, production had decreased to 4.43 bushels. This was before the effect of harvesting machinery had begun to be felt. People were leaving the farms and the production of wheat per capita was falling off. The limit with hand methods had been reached. Economists were alarmed lest a time should come when the production would not supply the needs of the people. Thru the aid of machinery the production increased to 9.16 bushels per capita in 1880, 7.48 bushels in 1890 and 8.66 bushels in 1900. Perhaps this also shows that the limit of production with present machinery has been reached. The production of corn has also increased but the increase is not so marked. The production per capita in 1850 was 25.53 bushels, in 1900 it was 34.94 bushels.

Although the cost of farm labor has doubled or trebled, the cost of production has decreased. According to the Thirteenth Annual Report of the Department of Labor, the amount of labor required to produce a bushel of wheat by hand was three hours and three minutes, and now it is only nine minutes and fifty-eight seconds. The cost of production, as compiled by Quaintance was 20 cents by hand (1829-30) and 10 cents by machinery (1895-96). It is also stated in the Year Book for 1899, Department of Agriculture, that it formerly required eleven hours of man labor to cut and cure one ton of hay. Now the same work is accomplished in one hour and 39 minutes. The cost of the required labor has decreased from 83 1-3 cents to 16 1-4 cents per ton.

Great changes can be accounted for by the introduction of machine methods for hand methods. For all people this has been beneficial. It has caused the rise of our great nation on the Western Hemisphere. To no class, however, has this change been more beneficial than to the farm worker himself. J. R. Dodge has summarized the benefits derived by the farm worker when he wrote: "As to the influence of machinery on farm labor, all intelligent expert observation declares it beneficial. It has relieved the laborer of much drudgery; made his work and his hours of service shorter; stimulated his mental faculties; given an equilibrium of effort to mind and body; made the laborer a more efficient worker, a broader man, and a better citizen."

Lastly, it seems conclusive that an agricultural college course is not complete in which the student does not study much about that which has made his occupation exceptionally desirable. It should be an intensely practical study, for under present conditions success or failure in farming operations depends largely upon the judicious use of farm machinery.

FARM MOTORS

By P. S. Rose,
North Dakota Agricultural College

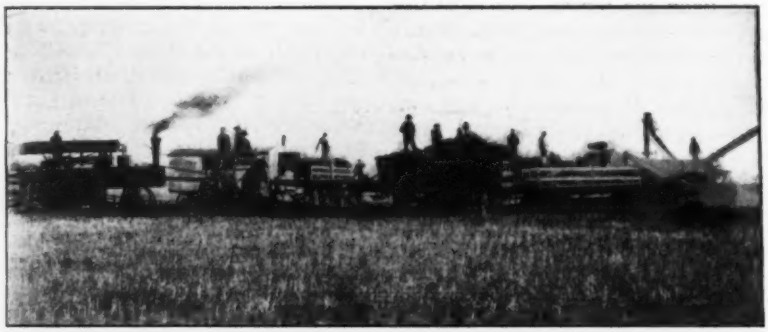
PIONEER life as it was lived fifty years ago has a romantic interest for those of us of the younger generation and we love to sit by and listen to some old settler recount the experiences of his youth. The clearing of the forest, the hunting adventures, the struggle against poverty, the long trips to market by ox team and the social life were all so different from present day conditions, that we marvel greatly. Times have changed wonderfully and the youth of the present can not adequately conceive of the trials of his fathers. In those days there were few large fields of grain, very little labor saving machinery and no power to do farm work but the strong hard muscles of man and beast.

In Europe where labor was plentiful and cheap, it was possible to farm many acres at comparatively small cost. In the South, under the system of slavery, large plantations could be worked by men who had sufficient capital. But in the free states of the North labor conditions were not favorable to extensive farming operations. In fact, the people who were farming in the wooded sections of the country found it impossible to clear a very large farm and so had not great need of improved machinery.

It was not until the Westward tide of immigration reached the prairie states where man's opportunities seemed bounded only by the horizon that any insistent demand ever arose for improved agricultural machinery.

The conditions were peculiar. The government stood ready to give away anywhere from 160 to 480 acres of land to whomsoever would agree to live upon it for five years.

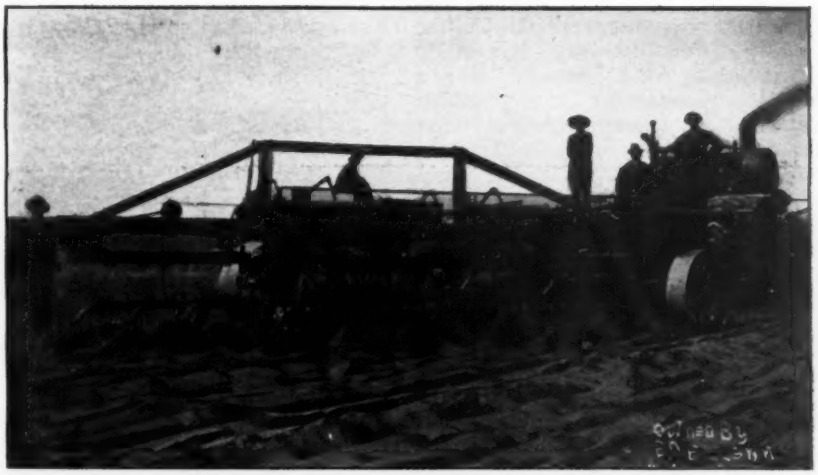
Labor was scarce and not to be had at any price, for there was no need of becoming a laborer when he who willed could become a land owner. Men realized that if they could farm their broad acres they could make fortunes in a short time, and all that was needed was either plenty of cheap labor or its equivalent, more perfect machines.



NORTH DAKOTA THRESHING SCENE

These conditions were unique in the history of the world, and consequently between the years 1850 and 1880 the attention of inventors was turned largely to agricultural implements, with the result, that all of the new types of machinery with which we are today familiar, with perhaps the single exception of corn harvesters, had their birth during this period which may well be called the Golden Age of Invention in agricultural machinery.

While general development has continued up to this time it was during the three decades before alluded to



THE LATEST TYPE OF STEAM PLOWING OUTFIT

that the present form was given to plows, harrows, seeders, haying tools, reapers, threshers, self-binders, wind mills, and gasoline engines.

The demand for greater power than could be furnished by the animals of the farm also made itself felt especially in the states devoted to the growing of small grains. This made itself most apparent during threshing time, and the need kept growing stronger as the farms became larger and the grain crops increased. At first manufacturers endeavored to supply this demand by building portable engines of from 6 to 20 horse power mounted on trucks, but they were soon found to be inadequate to the demands made upon them.

This brings us up to the time of the development of traction engines in America. Traction engines had been used for a good many years in England and had proven satisfactory, but were not introduced into this country to any extent until the latter part of the '60's since which time they have become the most important, excepting animals, of all the farm motors.

Twenty years ago it was rare to see an engine larger than 18 horse power even in the west while now an engine as small as that is considered almost a curiosity, at least in the wheat states.

The extent to which traction engines are used in North Dakota can be illustrated best by stating that there is one traction engine for every 3½ sections of land planted to small grains. As a further illustration of the extent to which they are used it may be interesting to note that the sales of threshing machinery by one branch house alone, in the city of Fargo, for the season just closed, amounted to over $600,000 and at least $400,000 of this amount was paid out for engines. This fact becomes all the more striking when one considers that there were 18 other companies doing a business in the same city ranging anywhere from $150,000 to $600,000 each. Not fewer than five of these companies report sales amounting to over one-half a million of dollars. The total number of traction engines built in the United States last year as reported by the manufacturers was 15,000.

The conditions existing in North Dakota are not peculiar to this state alone but hold true all over the Northwest and in Western Canada as well as in parts of the Southwest and on the Pacific coast.

The wheat harvests of the world depend very largely upon the trac-

tion engine. The wheat industry has grown to such vast proportions in the past 30 years that the grain could hardly be threshed from one season's end to another under the old method. The modern powerful engines, however, with their mammoth threshers are capable of handling the grain raised on a 100-acre farm every day. Where the grain yields well, 3,000 and even 4,000 bushels threshed in a single day are not uncommon records during the busy season.

Within the past five or six years steam plowing has come into extensive use all through the western part of the United States and in Western Canada. Plowing with a traction engine has been practiced in this country, it is true, for the last 25 years and at a much earlier date in England; but it has only been in the last five or six years that it has come into anything like general use in this country. Now nearly every engine sold in North Dakota and Western Canada is bought for plowing, or, with plowing in mind as a future possibility. The engines used for this purpose are larger and cost more than those used for threshing alone, but the difference in price between a plowing engine and one for threshing, amounts to only a few hundred dollars, and since this small difference will provide the user with an engine which may be used for two or three months during the busy season of the year, most farmers are willing to stand the added expense.

About six weeks ago the writer sent out a circular letter to a large number of prominent farmers in the state of North Dakota, with the object in view of getting exact data on the subject of steam plowing. Quite a good many replies have been received up to the present time, and in nearly every instance the user expresses himself as well pleased with the results. The following is a copy of the questions sent out with answers appended. These answers are fairly representative of all of the replies received up to date.

1. What is the size of your engine? Ans. 32 H. P. to 50 H. P.
2. By whom made?
3. What make of plows do you use?
4. How deep do you plow? Ans. 7 inches.
5. How many furrows can you turn in stubble? 12 to 16-14 in. wide. In breaking? 8 to 10.
6. How many acres can you plow in stubble per day of ten hours? Ans. 40 to 60. In breaking? Ans. 20 to 25.
7. What do you use for fuel? Ans. Flax straw, soft coal, or lignite coal.
8. What is the cost of fuel per ton at your nearest railroad station? Ans. $6.00 to $8.00.
9. How much coal do you use per day of ten hours? Ans. 2,000 pounds to 2,500 pounds.
10. How much water do you use per day of ten hours? Ans. 75 to 80 barrels.
11. How many men are required? Ans. 4 or 5. How many teams? Ans. One, for water.
12. What is the total cost of labor per day of ten hours? $8.00 to $18.00.
13. What is the cost of repairs on your engine per acre of plowing? Ans. About 1 cent per acre, estimated.
14. What is the total expense of running your engine per day in plowing, exclusive of interest and depreciation? Ans. $15 to $25.00.
15. What is the usual price per acre asked for plowing in your vicinity in stubble? Ans. $1.50 to $1.75. In breaking? Ans. $3.00 to $3.50.

The cost of a complete plowing outfit including engine and plows, ranges from $2,800 to $3,600, the cost of the plows alone being somewhere in the neighborhood of $1,000. The life of the outfit in this state, as near as can be estimated, is about seven years. The question naturally presents itself, does steam plowing pay? and strange to say it is not a question easily answered.

If teams and men were plentiful and wages reasonable it could be an-

swered in the negative, but under present conditions where the plowing must be done in a few weeks, owing to the shortness of the season, and where, owing to labor conditions, it could not be done in any other way at all, the answer must be in the affirmative, even though the cost per acre does seem to be excessive. It is simply a matter of getting it done that way or not at all.

Within the past five years the gasoline engine has come into extensive use for farm purposes all over the country. As a general rule the size of engines adapted for farm purposes ranges from 4 to 10 horse power; this size being large enough to do most of the work for which power is required on the farm. There are, however, a few concerns making gasoline traction engines with actual horse power ranging from 40 to 60, that are meeting with considerable success, in the way of sales. These engines are used for all the purposes to which steam traction engines are applicable. The results obtained by the users appear to be very satisfactory, judging from the answers which the writer has received in response to a circular letter sent out, and from personal observation in the field.

The future will probably see a considerable development in the gasoline engine industry, not so much in the changes in the design of this type of engine perhaps, as in the extent to which they will be used.

People are slowly becoming educated in the care and operation of machinery, with the result that engines can be successfully used now which 10 or 15 years ago would have required the service of an army of experts in the field. As time goes on more and more people will be mechanical experts, in a way, and the inevitable result is that the farming of the future will be done more largely than at present with the use of high grade machinery, and especially with mechanical motors of some sort.

RURAL WATER WORKS

By Edwin Hinckley Barbour,
Professor of Geology, University of Nebraska

WHY do communities persist in laboriously lifting water by hand when they can look to neighbors and see them using mechanical means. The house which is supplied with water pumped by hand has, as a rule, none of the conveniences of modern homes, while the house mechanically supplied need lack no convenience even though isolated on the distant ranches of the plains.

There is a wide difference between these two conditions when one seriously considers the domestic economy of the rural home. If there is one thing which adds more than another to the total comfort of the home it is an ample supply of water readily accessible for immediate use in the house and barn. Drop the pump handle, unless your time is worth little, and attach some prime mover, say the wind, or let water pump itself for you.

The observant traveler cannot enter the fertile prairies of Nebraska without noting that every scene is a windmill scene. As the sail boat breaks the monotony of the ocean's broad expanse, and is called the most artistic thing at sea, so the windmill is artistic in that it breaks and diversifies the petrified billows of the prairies. A Nebraska home without a windmill or some other water lifter is poor indeed. People too poor to buy, build, and if too busy to build, their boys build for them.

The shop-made mill, which is strong and serviceable, and as trim in construction as a spider's web, keeps the tank full. The tank in turn keeps the pipes full, and the pipes instantly supply water for laundry, kitchen, bath, lawn and stable. Thanks to such beneficial devices, one can see in the better ranch houses of Nebraska the same

Giant battle ax windmills used in irrigating a fifteen acre orchard in western Nebraska. Capacity of each will average nearly 1000 gallons an hour in a fifteen mile wind. Cost twenty-five dollars each.

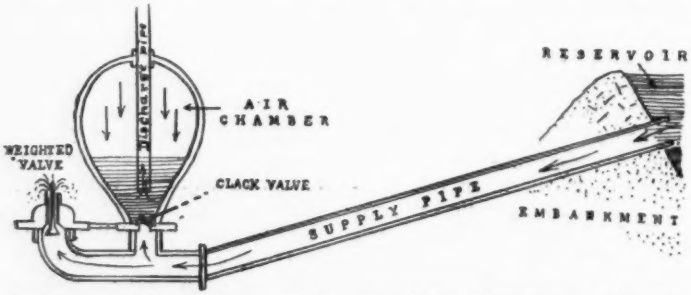
sanitary plumbing he finds in the city.

If the windmill tends to leak in summer, or if it freezes in winter, or if dust and dirt fall into it, or if its water is rendered objectionable by the growth of aquatic plants, there is a remedy. Put a pneumatic water-tank in your cellar. It is air tight and cannot leak; it is where it cannot freeze; dirt and vegetables cannot get into it. A little air is pumped into the steel tank along with the water and the pressure is steady, constant, and enough to force water to the roof of an ordinary house.

When there is water enough in the tank, the windmill is thrown out of gear automatically. When the pressure runs low, the mill starts of its own accord. It is an excellent system for village and country homes, and those observed in practical operation worked automatically and perfectly.

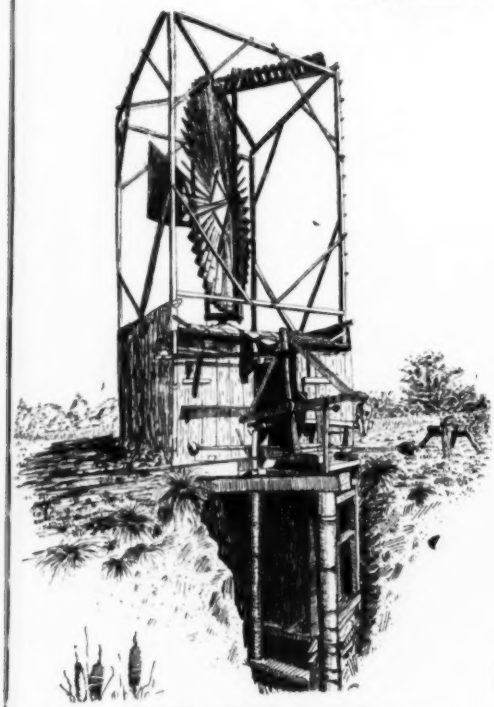
People of the east constantly wonder about the wild mode of life of the ranchmen of the west, and the greater would be their surprise to find a ranch house on the plains, far out on the sand hills, perhaps thirty or more miles from a railroad station, yet provided with all the conveniences and many of the luxuries.

It is true that many of our ranch houses already are, and all of them can be, strictly modern, thanks again to the mechanical means of lifting water. The luxuries and comforts of



Sectional view of a hydraulic ram. Works on the principle of momentum. Water pours out of the reservoir, stream or spring into the supply pipe and easily makes its escape at the weighted valve. But by the momentum of the water the weighted valve is suddenly shut, which causes the current of water to be driven violently through the clack valve, thus compressing the air in the air chamber to such an extent that it reacts and closes the clack valve. The compressed air drives the water in the air chamber out through the discharge pipe. While this is taking place the weighted valve drops and the operation is repeated continuously.

A SMALL JUMBO WINDMILL.
known locally as a "Baby Jumbo," seen in a small Nebraska town. This mill cost three dollars and seventy cents and supplies water to a small hotel and stable.

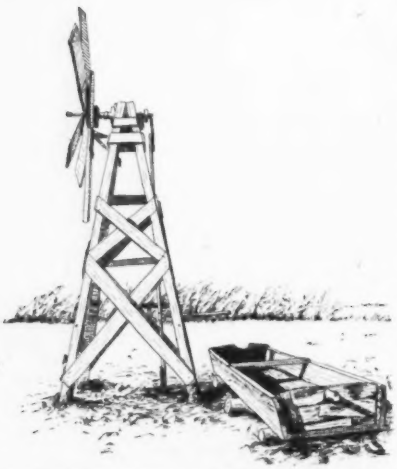


GIANT TURBINE WINDMILL.
Diameter 20 feet; irrigates ten acres of alfalfa, and six to eight acres of corn; drives two pumps. Cost sixty dollars. Western Nebraska.

the farm are none too many at best, and anything tending to relieve labor, and increase sanitation and comfort is to be welcomed.

Whether one uses the elevated tank of wood or of steel, better still the pneumatic tank, or builds a cement tank on some bluff or elevated spot, as is so often done in this state, the water pressure is sufficient to give the countryman all that the cityman gets in the matter of water supply. About the only difference is that the countryman may have to oil the windmill or other pumping machinery.

A few years ago the writer was put in touch, as well as in sympathy, with the poor man and his homemade windmill, and made it a point while doing geologic work throughout the plains to observe the various original devices for lifting water. Strictly speaking, it is not always the poor man who has these mills, it is quite often the rich farmer. The homemade windmill is so easily built, costs so little, and runs so well, where there is wind on which a community can depend, that it is almost a duty to have one or more if you cannot afford a shop-made mill.



SIDE VIEW OF SMALL TURBINE WINDMILL, CENTRAL NEBRASKA.

Certain very well-to-do farmers and ranchmen who find that the prevailing wind of their locality is not sufficiently steady for their windmill waterworks are installing gasoline engines, which are very satisfactory, inasmuch as they require little attention and can do a great deal of work at small cost. They not only run the pump, but are put to other useful work running various farm machinery, such as the grindstone, churn, lathe, feed choppers, and grinders.

An admirable pumping device, where there is a spring or stream of pure water, is the hydraulic ram. After the cost of installation is met, it continues to run without additional expense. It works on the principle of letting water which is going to waste pump water into the tank. It does its duty night and day and the tank is kept full. Where unusual amounts of water are demanded, these water rams are arranged in pairs or in batteries. Of late, firms have made experiments with water rams of great size, having in view the work of lifting large quantities of river or spring water for irrigation or other purposes.

Where there is pure water flowing away, its waste energy may be turned advantageously to lifting water for the house, and one cannot think of a much handier or cheaper way of doing the work.

Whatever the agriculturist sees fit to do about the water works of his farm or ranch, let him by all means avoid hand methods, for it is generally assumed that the man whose time will permit him to pump water year after year will always have the pump handle as his natural inheritance.

TYPE OF DUTCH WINDMILL AS ADAPTED TO USE IN EASTERN NEBRASKA. CAPACITY 200 TO 300 BUSHELS OF GROUND FEED A DAY, ACCORDING TO WIND.

POINTS IN BARN CONSTRUCTION

By H. E. Cook.

ORDER is heaven's first law," but we have not obeyed the injunction in barn and stable construction in the country. Our methods have been as varied as the form, color, and general appearance of our herds. Even the the careless observer knows that a certain peculiar form in the dairy cow is necessary for her specific function and the applied student recognizes it as a business proposition.

We are fast approaching a comparable condition in stable building. Thoughtful owners of live stock realize that results are the effect of certain causes and the milk producer in order to meet the demand for clean, wholesome milk must have stable conditions corresponding with his requirements. What are these essentials? Pure air and sunlight first—Walls and fixtures easily cleaned and the highest temperature possible without artificial heat.

We have none other than the same principle involved in house construction if we can only get that point of view. There we plan for pure air and larger window space with this difference only, that heat is furnished in one case through combustion of carbon in the animal, in the other through the burning of the same material in the stove or furnace.

In the home we build to conserve this expensive heat, we should do the same thing in the stable.

Why have we failed to do so, and how shall we accomplish the desired end? Our country is comparatively new and protection to animal life has not been recognized, chiefly because we did not seriously commercialize her product—and again those who first built with this principle in mind, were men of wealth who were not mindful of cost. We soon had an unwritten code that only men of wealth could build and own comfortable and sanitary homes for domestic animals. This was most unfortunate. We have, however, demonstrated that practical working farmers can with an investment of $50 to $100 per animal, have all of the comforts and essentials found through an expenditure of $500 per head.

The stable may be built as a first story to the usual rectangular form with storage above, which is the most economical plan, or it may be built shed like as an independent structure with fodder storage in a separate building. This plan has been more generally followed by producers of certified milk, not because it is now considered necessary, but was when many of the buildings now in use were built. This conception was inherited from those days when poles were laid as a ceiling above the cows so that dust and dirt were constantly falling. The tight ceiling and ventilation flues have completely insulated the stable from that portion used for storage, whether it be overhead or on the side.

Unlike the teaching of a decade ago when large roomy stables were advised, we know the possible heating limit of 1,000 lbs. live weight to be about 500 cu. ft. air space even when insulation is good.

This air space is also in keeping with the floor area necessary for convenient care of the animals and a satisfactory height of 8 to 9 feet.

INSULATION.

This most important feature is rarely discussed from its true scientific necessity. Even our best authorities upon ventilation either do not recognize its importance or fail to appreciate its effect upon moisture and control of air currents—cold storage construction fully recognizes this principle and follows it to extremes in order to insulate against higher temperatures outside.

I would not advise expensive insulation, if cheaply done equally satisfactory results follow. Concrete construction, which is advised, should have a dead air space between the two

parts of the side wall. Wood is, and will be for a time, the common material. We must, therefore, combine economy with efficiency. A single dead air space cannot be constructed of wood. A quality compact enough when nailed upon the studs or timbers to prevent any possible ingress and egress of air would be very costly, requiring frequent application of paint and putty and would finally fail of the desired result. I have practised and advised siding outside with matched lumber and inside with the same, or with a cheap grade upon which lath and a plaster of Portland cement could be placed. This air space should be filled with dry planer shavings packed closely. I have been severely criticised for this practice, but now after a dozen years experience, I am still confident that no system equals it. In the building of a fine milk plant this summer, all walls were filled with dry shavings, giving us at a minimum cost most perfect temperature control. This insulation is not necessary above the stock, a plain ceiling or plastered surface is sufficient.

LIGHT AND AIR.

Window space should be equal to five square feet per 1,000 pounds live weight. The windows should be hinged at the bottom allowing the top to swing inward. They should be hung near the inner side of the jamb providing space for storm windows in cold weather. In warm weather they serve as intakes. In cold weather the ventilation flues admit enough pure air.

CLEANLINESS.

Primarily the aim should be to remove every support, projection or lodging place for dust and dirt. This housing place must be as nearly as possible, a smooth rectangular box with nothing inside but livestock and means of fastening. While exterior architecture may require columns, pillars and friezes, it is not so with sanitary apartments for live stock. The fasteners for cows should be of iron. There should be no trace of wood in the floor construction.

The knowledge of cement as a building material is now sufficiently perfected to warrant efficiency and permanency. It is probably advisable in most cases to lay cement floors in checks. It is exceedingly difficult to compact a large area to such a degree that at some time it will not settle here and there a spot.

Concrete engineers are using three thicknesses of tarred paper, put together with coal tar paint, laid between the grouting and the surface finish coat about 3 inches thick as a preventative against moisture coming up to the surface and a loss of animal heat when resting upon the cement because of its power as a conductor of heat.

No doubt the most practical and serviceable manger for dairy stables is one built 3 feet 6 inches wide from stancheon base to outside and 16 feet high inside, sloping toward stancheon base.

Equipped with water supply and proper trap connection it may be considered a most approved water system. This stable equipped with the King system of ventilation will make a healthful home for stock and a fit place to produce the most delicate of human foods.

AGRICULTURE OF OTHER NATIONS—I
REPUBLICA ARGENTINA

By F. Aleman, '07.

SHORT HORN CATTLE IN ARGENTINA

THE Argentine Republic is situated in the temperate zone south of the Equator, between the 22° and 54° of south latitude and 50° 30′ and 69° of longitude occidental. The Argentine is bounded on the north by the Republics of Bolivia and Paraguay and the U. S. of Brazil; on the east by Paraguay and Brazil, Republic of Uruguay and the Atlantic Ocean and on the south by both the Pacific and Atlantic Oceans. The great chain of the Cordillera de los Andes, extending east separates Argentine from Chile.

Argentine is the second largest country in South America, after Brazil.

The peculiar location of Argentina, aided by the ocean on the east and the high mountains on the west makes its climatic conditions dependent on the direction of the winds. The east winds, which prevail in the northern portions of the country make the climate very uniformly temperate, as they bring warmth and moisture from the Atlantic ocean.

In the south, the prevailing winds are west and northwest, which make our southern temperature very dry.

In the north, the temperatures range from a maximum of 105° F. to a minimum of 30°; our hottest month averages about 80° F., and our coldest month about 52° F.

Our rainy season is generally in summer and our winter is generally dry. In the extreme northeast the rainfall is rather heavy, from 45-80 inches. The western region has a rather light rainfall, averaging about 30 inches.

On the Pampas the weather is very changeable, from cold dry south winds to the moist hot north winds, which occur quite suddenly and display great violence. Our most terrible wind is familiarly known as "Pampero." This will blow down houses, trains, etc., and sometimes will cause much damage among our cattle and sheep.

The highlands or mountains are made up of granite rock. The Andean region has a strata formation and is covered by a sheet of volcanic residues. In the Pampas the soil surface is composed of sand and clay material. In Patagonia gravel soils to a depth of 40 feet are found. This gravel is the action of disintegration and glacial processes. Large areas of sand dunes are also seen in the Patagonian regions.

The government of Argentina is both Federal and provincial.

The immigration question in Argentine is not as yet settled, as the country is not receiving the number of immigrants that it ought to. The Argentine government gives all kinds of facilities for work and occupation of the land. Everything is inviting. We welcome all the people that will come to settle in Argentina. I can-

not state the number of immigrants that go to Argentina per year. However, it seems to be a fact that immigration has been increasing in the last five years more according to our aspirations than heretofore.

It is hard to believe that there is a country in the world more cosmopolitan, other things being equal, than Argentina. Out of 5,022,248 inhabitants in the country, almost every nationality can be counted. Italians and Spaniards are in large numbers. There are also English, Swedes, Russians, Boers, French and Germans. Americans also contribute to the population of Argentina, but their number is not very great.

Railroads in Argentina are more developed than in any other country

WHEAT FOR EXPORTATION PILED ON THE WHARF AT COLASTINE

in South America. Most all of Argentina's steel tracks have been built by English capital and they are at present in a very prosperous condition. Approximately 30,000 miles of railroads are at present operated in Argentina. Our railroad stations are of the very best. The railroad system is as good in a number of instances as the best in the world.

Commerce is naturally prosperous in Argentine. A few years ago very little interest was paid to this far away South American country by our continental brothers. Things are now changing, however, and Americans are beginning to realize that there are other countries besides their own, which might be worth while looking at.

Almost every European nation has first class steamship lines running between Buenos Aires and the old continent. All those companies are increasing their service on account of the Argentine demand.

As one goes into the harbor of Buenos Aires, boats with the English, French, Italian, German and Japanese flags can be seen. The United States is rarely represented among them, and if it so happens that she is, it is only by some small, slow, insignificant cargo vessel. Due to our reputation as large grain and beef producers, our foreign trade is very large and constant. Our wheat, as well as our flour and beef have great acceptance in many parts of the world.

Most of our wheat goes to England, Belgium, Brazil, Holland, Germany, Spain, France, Africa, Portugal, and finally United States, which imported last year fourteen tons of Argentine wheat. Argentina's maize goes to England, Germany, France, Belgium and many other countries. Linseed finds its way to England, Germany, Belgium, France and Holland in great quantities, while other countries also take a few tons, including the United States which took six tons in 1905. The largest amount of our flour goes to Brazil and England. The United States took 300 tons last year. The largest tonnage of hard wood leaves Argentina first for the United States and second for Germany. Hardwood extract (tannin) is shipped in the same proportions. Our sugar cane goes to South Africa and Brazil. As many as 146 tons were imported last year from the United States. The total exports of frozen mutton were in 1905, 3,326,000 tons, 3,077,764 of that amount went to England.

It is a curious fact that in 1891 our flour exportation amounted to 7,015 tons and in 1905 had increased to the large number of 2,868,281 tons. The above figures will without doubt show the wonderful and rapid progress of

A GAUCHO AND HIS HORSE. THE COWBOY OF ARGENTINA.

the Argentine Republic during the past 15 years.

Our labor conditions are very good at present, as we are free from trusts, strikes, socialism and other pests which usually attack the sociology of a country.

Our wage system appeals to our laborers and as the country is in a prosperous age, living is not very expensive. Also the geographical situation of our country, in the temperate zone, does not induce or compel the laborer to buy many winter commodities, which are indispensible in many cold countries.

Agriculture is not as yet practiced in Argentina in all its scientific ways and methods. Agriculture is carried on extensively, however, as our climatic and soil conditions are of the very best, we have not had to appeal to artificial agricultural methods as yet. The rotation of crops, as well as the application of manure or commercial fertilizers is very little or not at all used by the Argentine farmer or "estanciero."

Our farms or estancias are very large, some containing thousands of acres of land.

Argentina's soil is very fertile and of an extremely fine texture. Natural grass grows in the fields in winter as well as summer, all these natural foods are highly appreciated by the "estanciero" and his cattle.

Wheat is without any doubt our largest crop. Maize comes second and linseed is third. Other products of minor importance have already been mentioned in the commercial section of previous columns.

The following data will give some idea of the progress of Argentine agriculture during the last ten years. In 1895 the number of hectareas cultivated was equal to 4,892,000 and the exports equal to $120,068,000. In 1905 the number of hectareas was equal to 13,081,460 and the exportation, in dollars value was equal to $322,844,000.

Animal industry is another of Argentina's great sources of wealth. There are from 24 to 30,000,000 head of cattle scattered along the Argentine plains. There are some 120,000,000 sheep. The cattle lately have been very much improved. The prevalence of the short-horn breed is becoming evidenced all over Argentina. Short-horn cattle seem to be the best adapted to our climatic conditions;

but the Hereford breed is now coming in strong. It seems to stand the high temperature of the northern part of Argentina better than any other breed, with the exception of our native cattle.

Our best sires have been imported from England and Ireland. The United States having been disqualified on account of the tuberculosis so frequently found among the American cattle.

During the year of 1905 Argentina exported the following number of live stock to different parts of the world: Cattle, 12,229; sheep, 57,966; horses, 8,906; burros, 3,007; mules, 18,728; swine, 127.

Animals imported to Argentina during the year of 1905 were: Cattle, 1,462; sheep, 5,652; horses, 567; burros, 238; swine, 167.

Argentine cattle are raised on natural grass and at certain seasons of the year they are turned into the alfalfa fields. No sheltering is needed on the Argentine farms, as the winter temperature never goes down low enough to make it necessary.

All agricultural machinery is imported from the United States, rendering a total of $28,000,000 trade for the United States.

The Argentine government owns some 32,165 square leagues of land which are available for distribution in accordance with the Public Land law:

Fiscal lands may be devoted to:

1. The formation of agricultural colonies and towns.

2. The formation of pastoral colonies.

3. Sale by public auction.

4. Letting under contract.

The applications for agricultural holdings can be made in each respective town or territory and also in the Federal Capital at the Bureau of Lands and Colonies.

To be a land holder in Argentine three conditions are required by the law:

1. To be native born, or to become naturalized within two years from date of purchase of the lot.

2. To be above 22 years of age, if a male; if a widow woman, to have at least one son above 16 years of age.

3. To bind themselves to stock the lot personally, and to build houses and pens and to plant one hundred trees on the farm.

OUR WINTER BIRDS IN THEIR RELATION TO AGRICULTURE—II. THE DOWNY WOODPECKER.

By Vaughn MacCaugney, '08.

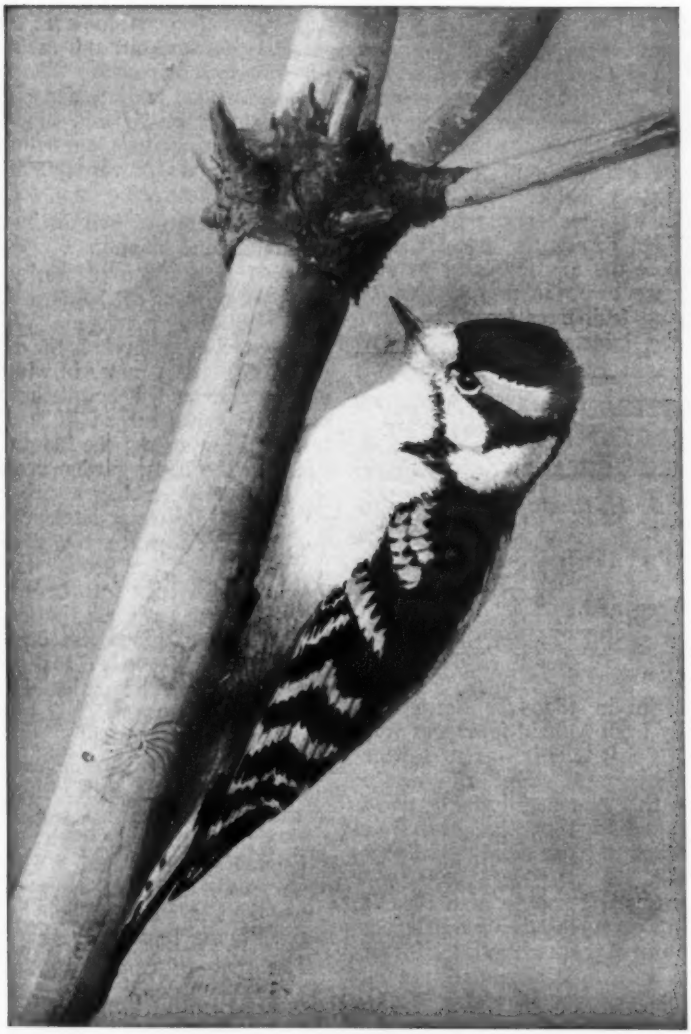
Our winter birds may be roughly classified, from the standpoint of their value to the farmer, into three general groups:

First—Those birds whose beneficial qualities are greatly overbalanced by their noxious qualities, making them decidedly undesirable; for example, the English sparrow.

Second—Those birds whose beneficial qualities are about equal to their noxious qualities, causing difficulty in deciding the true value of the bird, as in the case of the crow.

Third—Those birds whose beneficial qualities so exceed their noxious qualities, that we have no doubt as to the bird's value, but consider them as important helpers, and protect them accordingly. It is in this group of "the farmer's best bird friends" that we find the familiar downy woodpecker.

It is not strange that farmers are sometimes prone to look upon Downy with suspicion. Constantly seen in orchards, pecking at the bark, it is not unnatural to suppose that it is doing harm. The Downy, in many localities is called "sapsucker," although this is totally wrong, as it seldom or never sucks sap, and the true sapsucker is an entirely different bird, being much more uncommon than the Downy.



THE DOWNY WOODPECKER

The Downy is not a lover of sap, but of insects—caterpillars, ants, plant lice, scale insects, and especially the destructive woodborers. It is for this purpose that "friend Downy" has a sharp, chisel-like bill; a very long, horny-tipped tongue, like a barbed spear; long, curving claws that grip the bark firmly; stiff, sharp tail-feathers as braces; and a sense of hearing so acute that he locates a borer within the wood and cuts directly into its burrow.

Downy is sometimes accused of eating fruit, but the falsity of this charge is shown by the fact that, of 140 stomachs examined by the experts of the Department of Agriculture, only three contained fruit, apple being found in two and strawberry in one. On the other hand, three-fourths of the food consists of insects, and these

are largely grubs which other birds are not able to destroy, and which, were it not for the woodpeckers, could pursue their career of destruction unmolested. Man has not yet devised a successful method for destroying borers (for example, the peach-tree or apple-tree borers), and thus Downy is especially valuable. It is thus evident that woodpeckers are great conservators of forests and orchards. To them, more than to any other natural agency, we owe the preservation of timber and fruit trees from hordes of destructive insects.

PRACTICAL SOLUTIONS OF PRACTICAL PROBLEMS

BERLIN SEWAGE FARMING

By H. F. Major, '09.

One of the great problems of the day is the disposal of the sewage of our large cities. This was first experienced and met by the City of Berlin in Germany which went into the business of sewage farming "for its health."

In Berlin in 1870 the death rate especially from typhoid fever was very large. At that time it was 30.9. Soon after the introduction of sewage farming this rate was brought down to 18.5 and in 1895 the death rate was reduced to 7 per thousand of population.

The city itself has an area of 24.5 square miles while the farms cover an area of 37.5 square miles. In the city the system is essentially radial with 14 sewage districts. Sinks, tubs, closets, etc., empty into a main sewer which carries everything to a large pumping station. Here all the solid matter is taken out by straining and by chemical processes, and the water forced through pipes which are from 30 to 40 inches in diameter for a distance of from 6 to 15 miles and to an elevation of from 60 to 100 feet above the level of the station. This liquid matter is not only a means of irrigation but also has use as a fertilizer, since it contains a high per cent of ammonia, potash, organic compounds and phosphoric acid. Each day over 6,600,000 cubic feet of this water is pumped out and each section of the farms receives about 18½ cubic yards. On the "farms" themselves the reservoir and pipe system is likewise carried out—the outlet from the pipes is through hydrants which can be turned on and off at will.

The fields are of two distinct types, horizontal and sloping.

The former are of necessity nearly level, the contour of the natural sandy soil being easily managed. When the fields have been leveled, they are divided into beds 1 meter in width completely surrounded by ditches. The water on being turned in is only allowed to rise to 2-3 the height of the bed. In the beds, garden crops such as beets and cabbages are chiefly grown and the water leaches through the soil sideways to the roots. In those fields where grain is grown there is no division into beds and the water is simply run on the land, two or three times before planting. Here we find also extensive rose gardens which flourish with wonderful success.

The second class or sloping fields are mostly grass lands. The water flows over the entire surface of the land—the sediment is deposited, drys, cracks and decomposes and forms a very rich fertilizer. Plenty of seed is kept on the land and the grass on these meadows is cut from three to seven times a year. The yields are frequently 21 tons to the acre.

The sanitary conditions there are of prime importance, but we are surprised to see there located sanitariums for convalescents and consumptives. The health of all the farm population is thoroughly supervised and the drinking water there is continually analyzed. There is no perceptible odor in the vicinity or on these farms except, perhaps, just after the drains have been opened. These water odors are however by no means so unpleasant as many that we find in New York City on the East Side.

If, regarding the financial side of this problem, we take into considera-

tion the cost of management and the receipts from the products and disregard the interest, taxes and assessments on the land, we find that this business is unprofitable. During the years 1895 and 1896 the total receipts were something like $508,000 while the expenses amounted to $530,000 thus leaving a deficit of $22,000. If to this we add the interest on the debt, and something to the sinking fund, our deficit amounts to $390,000. Then if we count in the annual net cost of maintaining the radial system including the debt and sinking fund which is $1,155,000 our total deficit amounts to about $1,500,000 or $.97 per capita, which deficit is raised by internal revenue, tax fees et cetera.

There are, however, certain reasons for this deficit, some of which might be alleviated in other localities. Some of these are as follows:

A.—The Cost of the Land. This was somewhat excessive since it had to be purchased near the city with special reference to elevation and drainage.

B.—Cost of Preparation of the Land. This is also excessive due to the fact that there is difficulty in cultivating land in small strips with ditches between.

C.—Cost of Labor is Large. Of necessity the labor here is mostly by hand and laborers must be employed both day and night; thus a standing force *must* be maintained.

D.—There is a necessity of doing away with *all* the water even though there is more than is really needed.

E.—There is limitation on the rotation of crops and certain ones are overly plentiful.

F.—There is difficulty in disposing of such large crops as are produced upon these farms.

Regardless of the fact that the farming side seems here to be unprofitable we cannot, however, say that the system is a failure. On the contrary the financial results are by no means the most important and the economic results would proclaim Berlin's disposal of sewage as very satisfactory.

THE FAME OF THE COLLEGE OF AGRICULTURE

By E. W. Cleeves, '07.

One of the things that impress Cornell men, even though they be undergraduates working during the summer vacation, is the great things people on the outside expect of Cornell men. The reputation of the College of Agriculture has spread even to the far away hills of Connecticut where the echoes are never disturbed by the shriek of a locomotive.

The writer was attempting to run the farming end of a branch of the George Junior Republic. Three cows were kept on this farm. The first one, of no particular dairy breed, freshened about the middle of July. The second, a Jersey, and the third, no better as to dairy character than the first, were said to be due in September. The duty of these three cows was to supply the milk for twenty "citizens" and four grown people who made up the population of the Republic. Things went along fairly well until the latter part of August when a case of typhoid fever made more milk an imperative necessity. A sympathizing neighbor and friend of the Republic offered to give the Republic milk from her dairy if a boy could come for it. Shortly after this the president of the board, a clergyman of some reputation, heard about it. He seemed annoyed, thinking no doubt, that the milk shortage reflected on the management. "How is this," he asked; "that you do not have enough milk? You have three cows." He was told that two of them had just been dried up. "I cannot understand that," he replied; "you have a man here from Cornell College of Agriculture. With all the training he ought to have had and as well recommended as he was, I do not understand how he could have allowed the cows to dry up." One of those cows had a calf about two weeks after this conversation took place.

The Cornell Countryman

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JANUARY, 1907

The Countryman Board announces the election of S. F. Willard, Jr., and G. H. Miller as Assistant Managers. These elections fill the vacancies in the Board resulting from the lack of qualified competitors last year. The Countryman welcomes them to its board.

Rural Engineering

Until recently rural engineering has attracted but little attention. While the Agricultural Colleges have given much instruction telling how a farmer should grow his crops and care for his stock they have told him but little of how to build his house and barn, construct his lanes and roads, lay out his farm and fields, care for his machinery and tools, or drain and irrigate his land. These subjects we class under the general head of rural engineering.

The need for such courses has been felt at Cornell as it has elsewhere with the result that there has been an attempt to satisfy the demand in some small degree by offering two courses in alternate years or one course a year. When compared with the enormous material which should be covered, the instruction given in the short time devoted to these courses has been pitiable. No one has realized this more than the faculty of the College or the professor in charge of the course. The classes have been jammed to overflowing with students anxious to get some knowledge of this phase of agriculture but the instruction has from necessity been hurried and superficial. Not lectures but courses, not hours but years should be given to the subjects which comprise rural engineering. To requests from the students the faculty have replied that on the present funds it is impossible for a larger place in the college to be given to rural engineering; that they stand ready to organize and operate a Department of Rural Engineering as soon as the state will supply the necessary appropriation.

The State of New York has recently done much for its College of Agriculture but it has not done all. There are many branches of agriculture which must yet be developed if our college is to have the greatest efficiency. One of these is rural engineering.

The Honor System

We have heard much about the good and bad points of the so-called Honor System in examinations. In brief, the plan is to omit the overseeing professors and instructors from the class-rooms and to leave the conduct of the examinations to the students themselves; the claim being that the present system of faculty police is not only humiliating to all parties concerned but a failure from the point of supervision. The cribbing, it is said, goes on even under the most rigid inspection of the watchers. It is claimed that the stud-

ents if left alone would be able to so regulate the examinations as to stop the cribbing in most cases and to punish the offenders in all others.

In several courses in the Agricultural College there already exists a practice which gives us some indication of what might be done. In these courses the classroom is entirely left to the students during the examinations. No one is there to watch their conduct. No touching and ornamental speeches are made concerning the trust imposed. No pledges of correct conduct are given by the students. Without a brass band or other demonstration to advertise his faith in the students, the instructor quietly leaves the room. The examination proceeds of itself and the students go out when they please.

What are the results? We believe that in these courses there is little dishonesty. There is certainly less than where the prison system of police surveillance is used.

This or any other system which depends upon the students would be a failure unless the student body has a sense of justice toward the faculty, honor toward the college, and decency toward themselves, strong enough to entirely stop the cribbing. We believe that the student body is just, honorable, and decent, and that under an equitably devised system the instructor may be relieved from his disagreeable task of policeman and the student freed from the role of prisoner.

What this system may be must be left for committees from faculty and students to work out in unison and for the entire faculty and student body to ratify if they so desire. This at least is known, to be successful its foundation must be built upon trust in the students and the development of a sentiment strong enough to punish all offenders.

Get Behind the Teams

THE recent organization of 'cross-country and basketball teams, together with the renewed interest in baseball and the mention of a football squad next fall shows that the men of the Agricultural College are waking up in a way they have never done before. The reorganization of the college from the viewpoint of the faculty has been taking place for some time. The students have until now been slower. They have, in a measure, kept to themselves so that they have been unknown to the rest of the university and therefore somewhat misunderstood.

Now the College has awakened to its opportunity and its interests. The teams are practicing and whether they win or not the mere fact of their presence and competition will create throughout the university a sentiment toward the college which could not have existed before. The mingling of the men of our college with the men of the other teams will perhaps help *us* to better understand the men of the colleges we compete against.

It is up to every man to help *our* teams. If you can't be on a team get out and help by your interest and enthusiasm. Get out the men who can work on the teams. Help them to keep in training. Make the teams the best that we can get together so that if we win or if we lose we will have made good, will have done our best.

GENERAL AGRICULTURAL NEWS

So far has the fame of the Agricultural Assembly spread that other colleges are following the example set by Cornell, and establishing monthly gatherings of the agricultural students. A. T. Erwin, Associate Professor of Horticulture in the Iowa State College, reports the first meeting of an "Assembly" patterned after the one at Cornell, and which proved to be a great success. It is to be hoped that every Agricultural College in the United States will have their Assemblies where students and teachers can come directly in contact with each other.

That the activity in regard to agricultural interest is not confined to the European and North American people is very forcibly shown by the provisions for agricultural experimentation in foreign countries. Notable among these is the Fazenda Modeio or State Experimental Farm in Brazil whose director is J. William Hart formerly of the University of Illinois. The farm comprises nearly 800 acres upon which the principal crops of Brazil are grown. The Horticultural department has recently established a plantation of 9,000 coffee trees and a nursery contains 100,000 seedlings of oranges and lemons.

India likewise is arranging for the establishment of two new experiment stations, one at Attur and one at Randyal. The improvement at selection of cottons are to be studied at both stations. Besides this, former stations will take up the growing of fodder crops and the other sorgum cultivation.

In China the government has lately approved of a request from the native board of commerce at Peking for a field to be devoted to agricultural experiments. Since 1905 the board has been gradually establishing experimental fields and agricultural schools with a view to encouraging agricultural progress.

South Africa has recently established a farmers' reading course in practical agriculture. William P. Brooks, director of the Massachusetts Station, has charge of the course and his books, Brook's Agriculture, Vols. I and II, are to be used as the foundation of the work. The work is further directed by a 60 page syllabus which gives full directions for the experiments and contains over 2,000 questions in the lessons.

In Ireland the work in agricultural education is progressing favorably. The Annual Report of the Department of Agriculture, 1904-5, states that regular courses in agriculture were given at the Royal College of Science, Dublin, the Albert Agricultural College, Glasnerin, and at Munster Institute, Cork. The attendance at the first was 38, at the second 68, while the fifty who were enrolled at the Munster Institute were all young women. At this school courses are given in dairying, poultry keeping, gardening, sewing, cooking and laundry work and while the attendance is limited to 50, over 250 applicants for admission are on the waiting list.

CAMPUS NOTES

Beginning December 3, Dr. J. G. Lipman of the New Jersey Experiment Station, gave a course of ten lectures upon Soil Bacteriology. These were held in Sibley Dome and were largely attended by students in Agronomy and other departments of the College. Supplementing the lectures a series of demonstrations was given in the form of practicums. In order to allow students to take advantage of these lectures and demonstrations, which were the first ever held at the College upon this subject, classes in Agronomy 1 and 11 were suspended for the two weeks.

Dr. Lipman, who received his B. S. degree at Rutgers in 1898, his Master's at Cornell in 1900 and his Ph. D. at the same place in 1903, has become, as a result of his extensive training and natural ability, one of the foremost authorities upon the subject of Soil Bacteriology. His work at the New Jersey station has been of a high

order and has added much to the previous knowledge of the subject, and the College is extremely fortunate to have been able to secure his services.

* * *

At the Farmers' Institute meeting held at New Ipswich, N. H., on Nov. 28, Prof. J. E. Rice was one of the principal speakers. In the forenoon session his address was upon "Establishing a Poultry Plant," and in the afternoon he spoke upon "The Feed and care of Poultry."

During his absence, Prof. Rice visited the Hayward Poultry Farm at Hancock, N. H. This is undoubtedly the largest farm of its kind in the United States, and probably is unequalled in the world. The proprietors have at present 9,000 hens, which they intend to increase to a flock of 11,000 before the end of the winter.

* * *

The Department of Agronomy, which for the months of December and January will be in charge of Prof. Lyon, moved into the new building on December 6th. After moving is completed nearly all classes in Agronomy will meet in this building.

This department announces a slight change in its courses, in so far that Agronomy 11 will be repeated in the second term as Course 111.

* * *

The Agricultural Association has been holding well attended and interesting meetings during the last two months. On Nov. 6, Mr. Ghosh, gave an interesting and elucidative talk upon "The Agriculture of India." The address was illustrated with some excellent lantern views.

On Nov. 20, an open debate was held upon the question: Resolved, that the Barge Canal Amendment be repealed and the money appropriated for it be used toward the construction of good roads throughout the state. The members entered readily into the discussion, making the debate most interesting.

At the same meeting the Association voted to appropriate five dollars to be awarded in prizes to the first five men of the Agricultural College in the Inter-college race on Dec. 8. This sum was enlarged by contributions from other students of the college.

Mr. Rubinow was elected manager and Mr. Smith, captain of the Basket ball Team of the College.

On Dec. 4 the Agricultural Association held a mock trial, in which a case of rural nature was brought up and treated in an interesting manner.

* * *

The Eighth Annual Normal Institute was held during the week of Dec. 1 at the New York Experiment Station at Geneva, N. Y. The New York State Institute lecturers, of whom F. E. Dawley is the director, attended in a body, besides a number of other speakers from other states. The principal addresses were given by members of the Experiment Station staff and of the faculty of the Agricultural College at Cornell. Among the latter were Professors James E. Rice, W. A. Stocking, Jr., T. F. Hunt, J. L. Stone, J. W. Gilmore, T. L. Lyon, M. V. Slingerland, John Craig, G. F. Warren, and Instructors C. S. Wilson and J. E. Coit.

According to the program this Normal Institute has for its purpose the assisting of the regular institute speakers in making their work more effective. The speakers at this meeting impart the latest information upon subjects under consideration, thus bringing the speakers into closer touch with the Experiment Station and its work.

In 1907 the Institute will be held at the New York State College of Agriculture, and in future years will meet alternately at Geneva and at Ithaca.

* * *

At the meeting of the Association of Agricultural Colleges and Experiment Stations held at Baton Rouge, La., in the latter part of November, Professor L. H. Bailey was elected President of the Association.

In the M. A. C. Record is the report of an address by Mr. C. W. Garfield, in which he speaks in praise of Professor Bailey. Among other things he says: "In making an estimate of his character and influence, my first thought is of his rugged honesty, because this lies at the foundation of his service to the world. This attribute of character has shown itself from early boyhood in all his relationships and stands out as a salient feature of his best work."

* * *

Preparations were made by the Animal Husbandry Department for a trip to the International Live Stock Exposition in Chicago, but owing to several difficulties the trip did not materialize.

* * *

The recent publication of the Home Nature Study Course — "Teachers' Leaflet"—has had a wide circulation and is in great demand by training classes.

* * *

H. E. Van Orman, Professor of Dairy Husbandry at Pennsylvania State Agricultural College, inspected the new dairy department early in the month.

* * *

During the Short-course term, W. W. Hall, assisted by H. E. Austin, W. '05, will have charge of cheese-making; W. E. Griffith and W. E. Ayres, W. '04, butter-making; H. C. Troy, milk-testing laboratory; H. L. Ayres and Floyd Peabody, W. '05, dairy mechanics.

* * *

The dairy building was practically ready for the Winter-course men the first part of this month, and is now well equipped with handy devices and convenient arrangements that can be profitably adopted by commercial dairy establishments. The increased milk supply made necessary is being secured from the skimming plant at Sage, six miles north of here, also from N. Spencer, Brockton and Etna on the Lehigh Valley.

* * *

Miss Margaret Cook, a former member of the COUNTRYMAN board, is now engaged in teaching Nature-study at the Orphans' Home at Randolph.

* * *

F. H. Cardozo, who was a special student in Agriculture, is now professor of horticulture at Tuskegee.

FORMER STUDENTS

'92, B. S. A.; '93, M. S. A.—Fred W. Card, born at Sylvania, Bradford Co., Pa., Feb. 17, 1863, spent his first school days in the common district school studying the "three r's. The death of his father, when Mr. Card was a boy, compelled his removal from the farm to a village. At fourteen he entered the State Normal school at Mansfield, Pa., graduating at

F. W. CARD

seventeen. Being of such a youthful appearance, he was the subject of more than one hazing experience. He then taught in the common schools of Pennsylvania, beginning at $13 a month and "boarding around." He then entered a business college, but gave it up and started a fruit and market garden.

In the fall of 1889 he entered Cornell as a Special, feeling he could not afford to stay four years for the regular course, but later turned Regular and graduated in three years. Upon graduating he was awarded the fellowship in agriculture. Mr. Card while not receiving the first fellowship in agriculture, was the first one to retain it throughout the year. Before its expiration he was appointed assistant horticulturist of the Experiment Station. At the close of the year the University of Nebraska elected Mr. Card Associate Professor of Horticulture, in charge of the department.

He remained at Nebraska for five years, and assisted in securing a chapter of Sigma XI at that institution, Mr. Card having been chosen a member of the Cornell chapter at the close of his graduate year. In 1898 Mr. Card was chosen as Professor of Horticulture at Rhode Island and later was elected Professor of Agriculture the former title being retained by the Experiment Station.

"Bush-Fruits," an extension of his Master's thesis at Cornell, was published in 1898 and is one of the Rural Science series edited by Prof. Bailey. It is the best on that subject obtainable. His work at Rhode Island has been mainly along plant-breeding lines, which bring results very slowly. However, he has some raspberry and strawberry seedlings of promise, which are now being tested further. For several years past he has been interested in problems connected with farm management and has the material ready for publication of a book along that line, in the very near future.

Ex.-'89—Wm. H. Chamberlain has been re-elected to the First Assembly district of Steuben county. Mr. Chamberlain after leaving Cornell went to Raleigh, N. C., where for four years he was secretary to Hon. John T. Patrick, Commissioner of Immigration of that state. He returned to Kanona, N. Y., in 1893 and has since resided there. Mr. Chamberlain had never held office until his recent election on the Republican ticket, but had always taken an active interest in politics. While at Cornell Mr. Chamberlain was a member of Kappa Alpha fraternity.

'01, B. S. A.—A daughter was born to Mr. and Mrs. Milton Underdown on Nov. 4. Mr. Underdown is Superintendent of Wm. Cary Sanger's estate at Sangerfield, N. Y.

'03, Special.—H. S. Williams was in Ithaca recently visiting his former professors and inspecting the new agricultural buildings. Mr. Williams is general manager of the famous H. P. Hood Farm at Derry, N. H.

'04, Special.—Henry Truckell of Lacona, N. Y., was in Ithaca recently relative to the purchasing of some fine Holsteins. Mr. Truckell is still the right-hand man of Henry Stevens and Son.

'05, W.—Martin F. Barrus of Silver Creek, N. Y., and Edwin S. Howard are attending Wabash College, Indiana. Mr. Barrus is studying plant pathology and Mr. Howard, medicine.

'06, M. S. A.—W. H. Homer is now Professor of Horticulture at Brigham Young University, Provo, Utah.

'06, W.—J. A. Miller of Dansville, N. Y., has been carrying on successful experiments with bean and potato spraying and in seed selection of corn. He returns to this winter course and brings three other young men with him.

'06, B. S. A.—R. R. Slocum spent Thanksgiving in Ithaca. While here he observed some of the more recent experiments being carried on by the department of Poultry Husbandry. Mr. Slocum is an assistant in the Bureau of Animal Industry at Washington, D. C.

'06, W.—Geo. L. Amerman has returned again this year entering in the Poultry course. Mr. Amerman sent in a check of five dollars for the winter course student in Poultry making the best score at the annual poultry show. He also donated $25.00 for a prize to the student doing the best work in the Experimenters League for the coming year.

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The Winter's Farm

SMITHBORO, N. Y.

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"Thr wild earth it is swinging afree from its place."